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MARSHALL STAR

Serving the Marshall Space Flight Center Community

Aug. 3, 2006

NASA's Exploration Systems Progress Report

Main injector hardware testing at Marshall

By Sheri Bechtel

NASA engineers have successfully completed an early step in the development of the upper stage engine for NASA's Ares I crew launch vehicle and the Earth Departure Stage of the Ares V cargo launch vehicle — keys to the agency's exploration initiative.

D. Olive/MSFC

Subscale main injector hardware undergoes hot-fire testing at the Marshall Center in June. The tests are part of a five-month series.

The tests support development and integration of Ares I and Ares V under the Constellation Program, which is developing both space launch vehicle systems for NASA's bold plan to return humans to the moon and extend a human presence throughout our solar system.

Engineers at the Marshall Center recently conducted the first series of hot-fire tests on subscale main injector hardware. The injector is a major component of the engine that injects and mixes liquid hydrogen and liquid oxygen propellants in the combustion chamber, where they are ignited and burned to produce thrust. The initial tests were performed on a subscale injector that contained 40 individual elements for propellant flow.

See Hardware testing on page 6

Atlantis rolls!

By Sanda Martel from combined reports

Space Shuttle Atlantis' 4.2-mile journey from the Vehicle Assembly Building to the pad at the Kennedy Space Center, Fla., began Wednesday, Aug. 2, at 12:05 a.m. CDT.

Riding atop the mobile launch platform and carried by the crawler transporter, the orbiter was attached to its external tank and flanked by two solid rocket boosters. Once at the pad, the vehicle will be enclosed by the rotating service structure during its preparation for launch. From there, the payload for the mission will be loaded into the cargo bay. The launch window for the STS-115 mission to resume construction of the International Space Station is currently targeted to open Aug. 27.

The STS-115 crew consists of commander Brent W. Jett, Jr., pilot Christopher J. Ferguson and mission specialists Heidemarie M. Stefanyshyn-Piper, Joseph R. Tanner, Daniel C. Burbank and Steven G. MacLean, who represents the Canadian Space Agency.

During their 11 days in space, the astronauts will install the integrated P3/P4

See Atlantis on page 2

Director's corner

The largest threat to success tomorrow is our successes of today and yesterday

On my way home after the launch of Discovery, I began to download all the available pictures of the vehicle's ascent because there were many questions that needed to be answered. Over the next few days, it became pretty obvious that the Thermal Protection System on the orbiter was intact. I expected that to be the case, but lessons have taught me not to assume, so I was eager to see a picture of the vehicle for myself. Once Discovery was cleared for re-entry, I had to celebrate a bit, as I know many of you did. For over three years now, the Marshall team has faced some tough challenges with a very tough determination. We have learned incrementally. We've learned from the big and small things that didn't go right, and we've learned from our successes. It takes a lot of moxie to keep pace because the business we are in is consuming and so incredibly relentless. Despite the fast pace, there is something so incredibly special about the space program that we find ourselves wanting to stay persistent. And, quite frankly, that is how we should be. We are a spacefaring nation. America is the preeminent explorer of space, and we must remain so.

David King

Launching Discovery was a critical milestone for the agency. We went through an exhaustive process of getting ready to fly this mission. A lot of bright people spent an enormous amount of time trying to understand this complex vehicle and how it works. We all spent weeks weighing the risk to the program of not flying versus that of flying. We considered the crew rescue capabilities of the International Space Station, such that we could mitigate any threat to the crew. The Flight Readiness Review is an ideal forum to discuss and weigh all the risks, and I couldn't be more proud of the way the STS-121 readiness review was handled. All involved had an opportunity to present their viewpoint. We all have different perspectives and experiences that add value to the decision-making process, and providing an open discussion is an essential element of a culture that will lead us to success. In reality, for me, it actually came down to a programmatic risk decision. And, although some would say the data reviewed after launch proved the decision to be right, I say we need to continue to work hard to mitigate the technical risk that is truly there because it is clearly nontrivial.

When I consider everything it takes to do what we do, it is almost incomprehensible. It requires each part — literally and figuratively — to work well for the program to work. I recall a saying I learned several years ago: "The largest threat to success tomorrow is our successes of today and yesterday." STS-121 was about doing it right today. We must remain rigorous. Now is not the time to get comfortable.

We are not only making a difference, but in essence, we are making history. I am so appreciative of the work accomplished by this team, and I look forward to the journey ahead.

David A. King
Director, Marshall Space Flight Center

Atlantis

Continued from page 1

NASA

Lighted by the rising sun, Space Shuttle Atlantis nears Launch Pad 39B at NASA's Kennedy Space Center, Fla., where it will lift off on its STS-115 mission to the International Space Station.

truss segment with its two large solar arrays that will provide one-fourth of the total power generation capability of the completed station.

The writer, an ASRI employee, supports the Office of Strategic Analysis and Communications

Joe Ritch, local BRAC committee chairman, to speak at Marshall Association luncheon Aug. 8

Joe Ritch, chairman of the Tennessee Valley Base Realignment and Closure committee, will speak at the Marshall Association luncheon Tuesday, Aug. 8, at 11 a.m. in Building 4316.

The luncheon is $11 for Marshall Association members and $13 for non-members, payable at the door. Employees planning to attend must contact Sharal Huegele at sharal.b.huegele@nasa.gov or 544-728 by noon Friday, Aug. 4.

The association membership fee has been reduced to $12.50 for the remainder of the year and also can be paid at the door.

Marshall Center engineers team with the Army to solve mysteries in helicopter parts

By Lori Meggs

They begin with very few clues and then carefully collect evidence that leads to a discovery of what causes failures in Army helicopter parts. It's an investigative probe blending scientific and engineering principles. But this mystery is solved by engineers in a Marshall Center laboratory.

Under a NASA Space Act agreement, the Materials and Processes Laboratory of Marshall's Engineering Directorate is partnering with the Army Aviation Engineering Directorate, U.S. Army Aviation and Missile Research, Development and Engineering Center at Redstone Arsenal to conduct failure analysis on helicopter parts. The project taps Marshall's capabilities and expertise in metallurgy — the science of metals.

The Marshall lab is analyzing items such as engine parts, swashplates and fasteners from Army helicopters that have flown in the war in Iraq and Afghanistan. The parts under scrutiny are those that have experienced some type of failure with the metal product forms such as castings, forgings or extrusions.

The helicopter hardware is studied on a microscopic level, because most problems in metal can't be seen with the naked eye. Parts from Apache, Blackhawk, Chinook and Observation helicopters are analyzed in Marshall's state-of-the-art failure and analysis diagnostic facility in Building 4612. The facility uses high-powered microscopes to uncover the root cause of the problem, whether it's the way the part was machined, heat-treated or formed and fitted. The engineers also use fractography to characterize the fracture surfaces of the failed parts.

Marshall analysts take photographs of the part, document it and then dissect it for more in-depth study. "This is an excellent opportunity for two government agencies in the same location to share resources," said Tim Vaughn, chief of the Metals Engineering Branch at Marshall. "The tests we are conducting in this lab are saving lives," he added. "If we can find things to make the parts perform better, then we are making it safer for these Army helicopter pilots and soldiers being ferried, too."

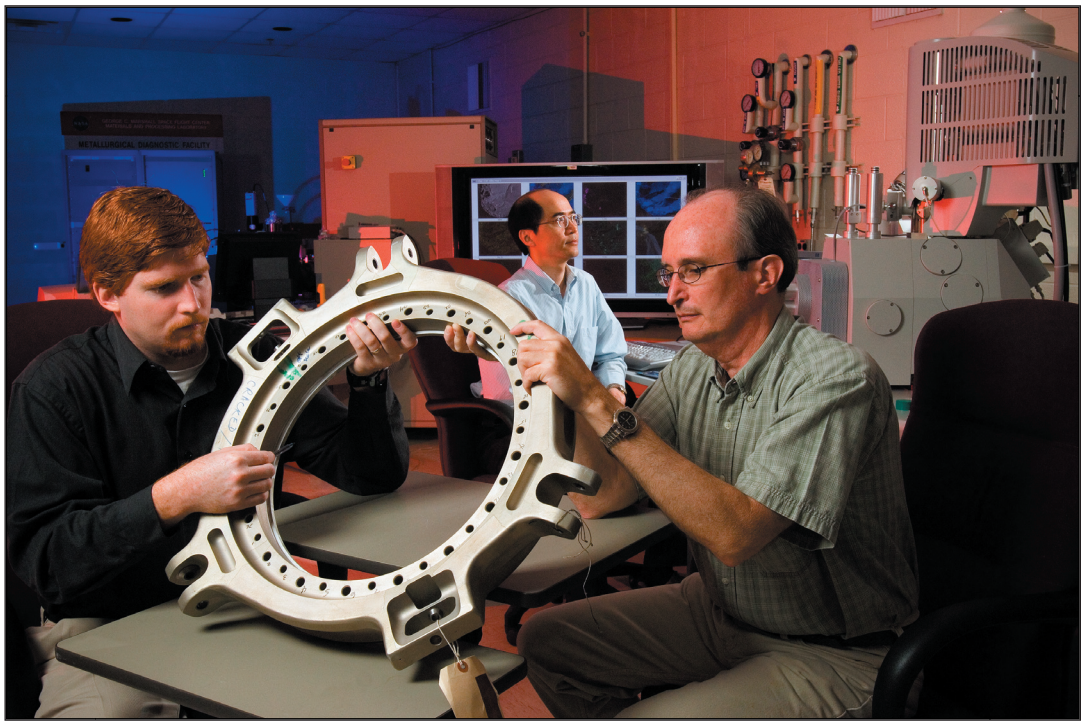
When the lab receives a part to investigate, analysts strive for a one-month turnaround for results — often in half the time compared to other facilities that do the same type of work.

The team currently is analyzing turbine wheels in OH-58 helicopter engines. Turbine wheels are important moving components that make helicopter engines run and usually experience a great deal of stress. This particular piece of rotating machinery failed during an exercise, and it's up to the Marshall experts to determine if the failure stems from fatigue, metal problems or wheels that have simply exceeded their life limit.

"The long-term expertise of identifying materials failures in the Marshall lab is invaluable to the Army," said George Hanna, a contractor support metallurgist for the Army's Aviation Engineering Directorate at Redstone. "We usually send failed parts to the prime contractors, but doing independent analyses here identifies real problems faster, and it's more cost efficient."

Over the past two years, the Marshall team has made dozens of recommendations to the Army that could prevent future failures from occurring between normal maintenance cycles or, at best, extend the maintenance cycles so they can fly more missions per unit time in harsh conditions and climates throughout the world.

The writer, an ASRI employee, supports the Office of Strategic Analysis and Communications.



David Higginbotham/MSFC

James Van Hoose, left, and Dr. Po-Shou Chen, center, engineers with Qualis Corporation in Huntsville, and Stephen Cato, right, a NASA engineer in Marshall's Materials Diagnostics Laboratory, analyze a rotating ring from an Army helicopter rotor.

Margot Thigpen, executive assistant to the center director, keeps the director's suite organized

By Jessica Wallace

For Margot Thigpen, balancing a sizeable and varied workload is all in a day's work. As executive assistant in the Office of the Director, she provides support to Marshall Center Director David King. It is a position she has held for three years of her 19-year career at Marshall — a position Thigpen describes as pieces to a large puzzle, with its numerous responsibilities that she manages.

Her primary responsibility is to coordinate all of King's scheduling, such as calendar, travel, agendas, visits and meetings. "I work with a great team and focus on helping everyone stay on course," said Thigpen. "It can get very hectic in the director's suite. We have many policies and procedures to follow, so part of my time is spent providing assistance to Dave and other support people."

King hosts many high-level visitors, from members of Congress to NASA Headquarters officials. The director's team works with other Marshall organizations, such as the Office of Strategic Analysis and Communications, to make sure everything is set for the visits.

Thigpen said her biggest challenge is preparing King's travel schedule. Since he's the center's top ambassador, getting him where he needs to be is crucial. "Everything that goes on in the center director's office has to fall in place," she said. "There's not a single item that doesn't have to be carefully coordinated. From a personal standpoint, because of his heavy travel responsibilities, it is important to me that I can help balance his hectic work schedule with family time, which is very important to him."

Juggling these responsibilities and challenges in the director's office, Thigpen provides support to Marshall's mission. "When people call the office, I focus on being the best advocate for Marshall," she said. "I am often reminded of something Dave King says: 'We're ordinary people doing extraordinary things.' He is right. It is an honor to be here and be a part of history in the making."

Thigpen began her Marshall career in the Shuttle Propulsion Office in 1987 as an assistant to Otto Goetz, who worked closely with Dr. Wernher von Braun. Von Braun was the first director of the Marshall Center. In 1993, Thigpen moved to Space Transportation, now called the Exploration Launch Projects Office, as the executive support assistant for the organization. When Jim Kennedy became Marshall's deputy director in 2002, Thigpen was named his executive support assistant. That same year Kennedy, who is currently the director of the Kennedy Space Center, was named deputy director of that center and King was appointed deputy director of Marshall. "I had the opportunity and honor to remain in the deputy director's office," said Thigpen. "When Dave King was appointed Marshall Center director in 2003, I became his assistant."

Before coming to Marshall, Thigpen served as a senior secretary to the inspector general of the Navy in the Naval Oceanography Command Organization at Stennis Space Center, Miss. Her husband, Charles, also supported Stennis in the Space Shuttle Division as a quality inspector for every inch of the space shuttle.

David Higginbotham/MSFC

Margot Thigpen provides assistance to Marshall Center Director David King.

See Thigpen on page 5

Marshall Center directors' executive assistants from 1960-1997

Emmett Given/MSFC

Recently, executive assistants to the first eight Marshall Center directors gathered at the University of Alabama in Huntsville library to participate in a video for the UAH archives. For historical purposes, each recounted joining NASA and how she became a center director's executive assistant — then called an executive secretary. From left are former assistants Bonnie Holmes to Dr. Wernher von Braun, Dr. Eberhard Rees and Rocco Petrone; Gertrude Conard to Dr. William R. Lucas; Evelyn Staples to James R. Thompson; Sandra Turner to Thomas J. (Jack) Lee; Joanne DeGroff to Lee; Beth Partain to Dr. Wayne Littles; and Jerry Ann Ise to Porter Bridwell.

Thigpen

Continued from page 4

He transferred to Marshall's Space Shuttle Division in 1987 to continue his career as an inspector.

Being the center director's executive assistant puts Thigpen in a very busy environment — one that is both interesting and challenging. "Some days change themselves on their own, depending upon the events of the day," said Thigpen. "I focus on remaining calm. I try to not let things rattle me. I just try to stay a step ahead. Our team looks at the big picture and how it all fits together."

Throughout her NASA career, Thigpen has received numerous awards including the Group Achievement Award in 2004 for her achievements and contribution to America's space program; a Silver Snoopy Award in 2001 for outstanding performance contributing to flight safety and mission success; the NASA Medal for Exceptional Service in 1994; and a Space Flight Honoree Award in 1992.

Thigpen was born in New Orleans and lived there until she was 13 when her family moved to Picayune, Miss. After she graduated from high school, she enrolled in Pearl River Community College in Poplarville, Miss., where she studied secretarial science and bookkeeping for two years.

Away from Marshall, Thigpen claims to be a "homebody." She has three children: Chris, a dispatcher in Marshall's Protective Services Office; Angela, a homemaker in Athens; and Jacob, who is serving in the U.S. Army in Iraq as a specialist class 5 in the 172nd Stryker Brigade Combat Team.

"I enjoy spending time with my family," said Thigpen. "I also like working in my flower gardens. Lately, most of my free time is spent with my three Dachshund puppies. They are 6 months old and a handful!" she said.

The writer is the Marshall Star editor.

Chuck Lovell named 2006 Shuttle Propulsion Employee of the Year

By Sanda Martel

Chuck Lovell has been selected 2006 Space Shuttle Propulsion Employee of the Year, recognized for his outstanding performance, dedication and team work.

One of the 12 monthly award recipients who is eligible for the annual honor, Lovell was selected through a vote by all employees of the shuttle office.

Chuck Lovell

Lovell is assigned to the Program Planning and Control Office. He directly supports the Building 4202 facility manager and assists with all NASA and contractor moves in that building. He also supports safety and awards functions, building maintenance activities and the Shuttle Propulsion Office's annual safety and building inspections.

"This is a guy you see all over the building, always working, always pleasant," said Robert Lightfoot, manager of the Shuttle Propulsion Office, when he presented the award recently at a shuttle all hands safety meeting.

"Your 'can-do' attitude and punctuality demonstrate a true appreciation for being a part of the shuttle team," said Lightfoot. Lovell was cited for his continual support and attention to detail, diligence and initiative to accomplish huge assignments with ease.

Lovell joined Morgan Research Corporation of Huntsville in 2004, working under the Unified NASA Information Technology Services contract. Morgan is one of 15 main members of the Science Applications International Corporation team that performs information technology management service functions agencywide, including information technology systems and services support for Marshall programs and projects.

Born in Birmingham, Lovell and his parents, Lenna and Charlie Lovell, moved to Huntsville in 1960. His father, an employee of Hayes International Corporation of Birmingham, was manager of Marshall's model shop, which built Saturn rocket models. Lovell graduated from Lee High School in 1978 and has worked more than 23 years for Marshall contractors supporting NASA programs.

At one time Lovell, his father, brothers Tim and Terry and sister Nancy worked at Marshall — all for different companies. Tim and Nancy work in the Space Shuttle Main Engine Office.

A resident of Toney, Ala., Lovell is a motorcycle enthusiast who enjoys all motor sports, especially stock car races.

The writer, an ASRI employee, supports the Office of Strategic Analysis and Communications.

Hardware testing

Continued from page 1

The tests, part of a five-month series begun in May, were conducted in Marshall's East Test Area by a joint center team including members of the Exploration Launch Projects Office, Engineering Directorate and Safety and Mission Assurance Directorate.

The hot-fire tests are part of efforts to investigate design options and maximize performance of the J-2X upper stage engine. The J-2X is an updated version of the powerful J-2 engine used to launch the Saturn V rocket upper stages during the Apollo moon program in the 1960s and 1970s. The J-2X is intended to power the Ares I upper stage, which will put the Crew Exploration Vehicle into orbit.

The engine also will propel the Ares V Earth Departure Stage, which will carry the lunar lander on its journey from low-Earth orbit to the moon.

During the tests, engineers fired the injector horizontally at steady-state conditions for durations of 10 to 20 seconds at a thrust of approximately 20,000 pounds. The hot-fire tests were conducted with varying fuel temperatures and different propellant mixture ratios to document how the hardware performs under a variety of conditions.

"What we're looking for in this test series is repeatability," said Mike Shadoan, combustion lead for Marshall's Upper Stage Engine Office. "By looking at performance trends of the injector, we can better understand what tweaks we need to make to ensure the engine fires safely and reliably. This knowledge then will be used to design and develop the full-scale J-2X injector."

Approximately 50 hot-fire tests are planned for the series. Along with the subscale 40-element injector design, engineers also plan to test a 58-element design.

The injector component testing is the first of four major component test series planned for the J-2X engine at Marshall. Three additional full-scale combustion device test series are planned for 2007.

The writer, an ASRI employee, supports the Office of Strategic Analysis and Communications.

Marshall employees honored

Marshall employees recently were honored for their roles in developing and commercializing a new aluminum alloy. The NASA-developed High-Strength Aluminum Alloy recently received a Federal Laboratory Consortium Technology Transfer Award for Excellence. This new aluminum-silicon alloy offers higher strength at higher temperatures — 500 to 700 F.

Individual honorees included **Jonathan Lee**, inventor; **Po-Shou Chen,** co-inventor with Qualis Corporation, Huntsville; and **Sammy Nabors,** Commercial Technology manager of the Technology Transfer Program Office.

The award recognizes outstanding work in transferring federally developed technology to the marketplace.

For engine manufacturers, the new aluminum alloy fuels the promise of making internal combustion engines and components that produce more horsepower while emitting less pollutant. Because the new alloy is stronger than traditional alloys, it enables optimized designs that require less material, which reduces weight and cost and improves fuel efficiency.

Mike Vanhooser, Business Development Office deputy director, was recently presented with the 2006 Distinguished Alumnus Award by Tennessee Technological University's Department of Industrial and Manufacturing Engineering.

Dr. William Emrich, from the Propulsion Systems Department, received the American Institute of Aeronautics and Astronautics Nuclear and Future Flight Best Paper Award for his paper "Microinstabilities in the Gasdynamic Mirror Propulsion System."

Classified Ads

To submit a classified ad to the Marshall Star, go to Inside Marshall, to "Employee Resources," and click on "Employee Ads — Submit Ad." Ads are limited to 15 words, including contact numbers. No sales pitches. Deadline for the next issue is 4:30 p.m. Thursday.

Miscellaneous

4 side-by-side plots in Valhalla Masonic Gardens, $7,000. 256-881-9421

Antique oak carved dining room chairs. 6 plus 1 armchair, $425. 679-0485.

Beatles: Original first-edition 1964 and 1965 "A Hard Day's Night!" and "Help!" books. $80. 303-3702

Doberman, red female, 2 yrs. old, family pet, full-blooded, no papers, spayed, $125. 348-2670

Hutch, 3-drawers, 2 doors, 72"x32", $125; large PetMate Vari Kennel, 26"x30", $50. 722-9989

"Outward Hound" red Sling-Go pet carrier, hammock design, fits up to 20 lbs., $25. 256-776-4889

Aluminum flat-bottom boat, 14', trailer, electric motor, many accessories, $700. 256-604-8661

Associated Electronics Monster GT, Nitro-powered, radio-controlled Monster truck, many extras, $350. 256-566-7381

Radio Flyer all-terrain red wagon w/wooden sides and large tires, $90. 353-0370

King-size wood waterbed frame with regular Serta mattress, $100. 864-0413 after 6 p.m.

RIDGID woodworkers tools, 11 pieces, new-in-package, never used, $2,100 for all. 256-851-9287

Three desks: metal, wood, computer, $60 each; Sun/Sony 20" Trinitron monitor, $175. 509-9351

Small clip earrings from Hawaii, coral or opal, $8-pair; pineapple pins. 837-6776

Day bed w/mattress, metal frame, white w/gold trim, $60. 656-8742

MTD rear-tine tiller and Murray riding mower, needs work, $200 for both. 828-5246

Queen-size bed, Pier Group design, lots of storage, no mattress. 461-7786

Reflecting telescope, 6" f.8, battery-powered equatorial platform, eyepieces, solar filter, finder scopes, $450. 883-9361

iPod Remote Interactive Dock DS-A1, for Onkyo stereo/home theater system, never used, $65. 256-828-1234

Ampeg Reverberrocket, 2x12, 50-watt guitar amplifier, new tubes, 12AX7 and EL34, $450. 479-8536/Josh

Two side-by-side eye-level crypts in Valhalla Memory Gardens, $5,200. 860-558-3063

Huntsville school-approved used Yamaha clarinet, $700; Alto saxophone, $1,000. 883-2733

Concrete landscape edgers, red, scalloped, curved and straight, $1 each. 325-4731

Four cemetery plots at Tri-Cities Memorial, Florence, $5,800. 256-436-1106

Three-piece living room set, sofa, loveseat, chair, sage green chenille, 3 yrs. old, $450. 655-6293

Utility trailer, Snow Bear Model 8000, 54"x92", pre-wired, $450. 256-679-2429

4 side-by-side plots in Valhalla Masonic Gardens, $7,000. 256-881-9421

2 large birdcages. One square with stand, $50. One round with stand, $25. 655-1155.

Vehicles

1958 Chevy Apache pickup. 777-6167

2004 Chevrolet Z71, 4-door, charcoal gray, 33K miles, leather, 6-disc changer, loaded, $23,500. 509-3208

1994 GMC Suburban SLE, front/rear air, third seat, towing package, 177K miles, $3,500. 509-3510

1998 Nissan Maxima, one-owner, auto, 148K miles, $5,700. 256-527-8116

1999 Yamaha XT225, $1,650; 1998 Yamaha PW80, $500. 233-5620 after 6 p.m.

2005 Suzuki GSX-R750, $8,500. 256-852-6335

1997 Nissan Maxima, teal w/tan leather, moon-roof, loaded, $9,800. 256-508-5503

2002 Prowler 5th wheel w/slide out, sleeps 8, bath, refrigerator/freezer, 18K miles. 721-1260

1999 Javelin Bass boat, 19', w/1999 Evinrude 175HP, TM/DF/GPS, hydraulic steering, tournament ready, $11,500. 837-4136

2002 Honda Accord EX, silver, sedan, 53.5K miles, $13,495. 256-679-6506

2000 Nissan Frontier Crew Cab, automatic w/overdrive, all-power, CD/cassette, 103K miles, silver, liner, $9,700. 880-9025

2004 Dodge Intrepid ES, 3.5L/V6, leather, warranty, 68K miles, $8,800. 256-837-8389

Jayco camper, 18', new tires, kitchen, bathroom, sleeps 6. 256-891-1550

2005 GMC Envoy XL, white, 24K miles, factory warranty; $20,900. 256-498-3816

2005 Harley Davidson Ultra Classic, fully-loaded, Stage One kit, Screaming Eagle pipes, 5.3K miles, $18,000. 714-6262

2004 Camry, V6, silver, black leather interior, all-power, low mileage, $17,750. 682-6633

2004 KTM300 dirt bike, Scott's damper and other components added, $3,500. 256-508-9657/Bob

1999 Ford Mustang Cobra ST convertible, electric green w/tan leather, loaded, 64.8K miles, $14,950. 256-586-7181

1998 GMC Yukon SLT, maroon w/tan leather, 4WD, auto, $9,400. 682-6326

1978 Chevrolet l/2-ton pickup, 350/4bbl, trailering special (suspension/transmission), $400. 227-0339/Dave

2004 Honda Civic EX, $15,500. 233-6197

2001 Ford Windstar SE, leather, rear a/c, rear bucket seats, PW/PDL, am/fm/cassette/CD, 97K miles, $8,950. 256-497-3951

1996 Cadillac Deville, loaded, green, $3,400; 1995 Deville, Concours, black, loaded, $2,500. 256-520-2802

1994 Ford Aerostar XLT passenger van, maroon, a/c, CD, $1,500. 256-683-9509

2000 Nissan Altima, black, auto, a/c, $5,000. 256-990-1626

Lexus RX 300, black, 97K miles, new brakes, $15,000. 683-0627/George Baker

Wanted

Used single-shot shotgun. 881-9426

Duck hunting stamps, paying $3 each or make offer. 256-684-2187

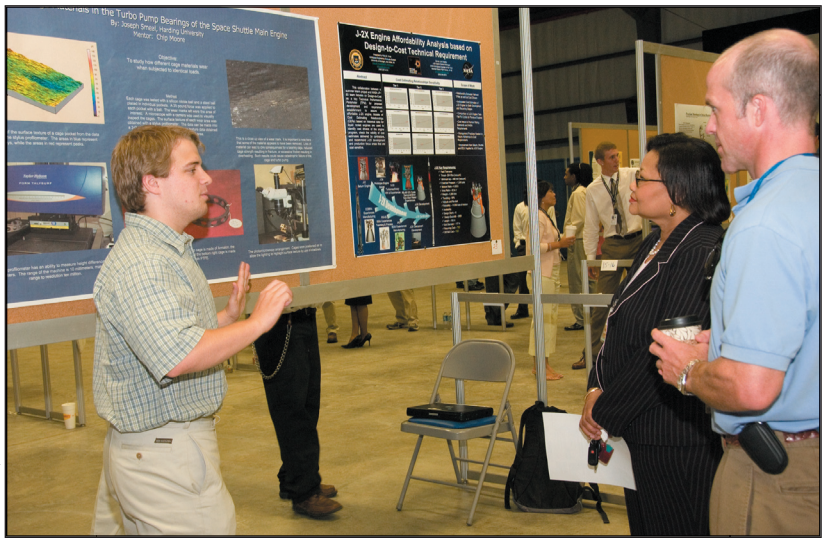
Free

Hunting dogs: Lab mix male puppy; 2-year old female, spayed; must find good home. 498-3023

Kitten, 6 weeks old, female, black, gray and brown. 256-837-7371

Katrina dogs for adoption, several breeds. 859-5550

Poster exhibit showcases research projects by Marshall's summer interns



Emmett Given/MSFC

The first Summer Intern Poster Day, hosted by the Academic Affairs Office, was held on July 26. Marshall summer intern Joseph Smeal, left, explains his research project to Gail Gordon, center, and Chip Moore, both with Marshall's Materials and Processes Laboratory in the Materials Test Branch. Moore is serving as Smeal's mentor in the Marshall Space Grant Summer Internship Program. A senior in chemistry at Harding University in Searcy, Ark., Smeal focused his project on the space shuttle main engine and how different ball bearing cage materials wear when subjected to identical loads. More than 120 future explorers and scientists participated in Marshall's 2006 summer internship programs, which began in May and end in August. The programs provide students the opportunity to gain work experience directly related to their program of study.

MARS Running Club members win second and third place in Cotton Row Run

MARS Running Club members recently participated in the 27th annual Mercedes-Benz Cotton Row Run through downtown Huntsville. The Cotton Row Run, hosted by the Huntsville Track Club, is ranked as one of the 100 best road races in the country by the magazine, Runners World. This is the third year MARS has entered teams in the race's Corporate Cup Challenge. The club won second in the male division and third in the co-ed division. Winning medals were, from left, Andy Brown, ER41; Jay Perry, EI21; Tom Williams, EI53; Russ Huffman, ER22; Sam Ortega, MP51; Hank Miller, MP41; Ryan Decker, EV13; Mark Hill, MP41; Mark Jackson, EV41; and Tom Smith, EV11. Runners not pictured are Cynthia Vemmer, RS01; and Paul McConnaughey, EV01.

Emmett Given/MSFC

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